

## CONNECTION ELEMENT

FIELD OF THE INVENTION

The present invention relates to a connection element and a method for positioning a magnetic field sensor suite into a zero line of a magnetic field of a magnet in a connection  
5 element.

BACKGROUND INFORMATION

German Patent Application No. DE 101 11 020 A1 describes a connection element which is configured for the measurement of  
10 force, preferably in a vehicle seat, in which the displacement between a Hall-effect sensor and a magnet provoked by the introduction of force is measured as a measure of the force.

SUMMARY

15 An example connection element according to the present invention, or example method for positioning a magnetic field sensor suite according to the present invention may have the advantage that an alignment, i.e., the positioning of the magnetic field sensor suite into the zero line of the magnet,  
20 is simple and reliable. In the manufacture, in particular, such a simple alignment of the sensor is necessary for cost-effective production. According to an example embodiment of the present invention, a holder which is easy to move so as to ascertain the zero line by simultaneous electrical  
25 measurement at the magnetic field sensor suite, is provided for this purpose. The method according to the present invention is able to be automated, in particular. If the adjustment was detected, the holder is fixated on the connection element, preferably by laser welding. The magnetic

field sensor suite is mounted on the holder as Hall-effect sensor.

It may be especially advantageous if the holder may be  
5 displaced only linearly, the clearance between the magnetic field sensor suite and the magnet remaining constant. In this way the magnetic field sensor suite, which is preferably a Hall-effect sensor provided in the form of an integrated switching circuit, is moved in one plane only, so that it is  
10 very easy to find the zero line. The linear displacement in one plane is made possible by a spring element of the holder. This spring element is preferably part of a sheet which is integrated in a plastic part of the holder. The spring element has the function of disallowing any play for the holder once  
15 it has been installed in the connection element, but still allowing it to be moved by applying light force. Corresponding actuators may be used for this purpose. However, this adjustment may also be done manually.

20 As an alternative, the holder may advantageously allow the positioning of the magnetic field sensor suite into the zero line by a rotation. The holder has a round form in one region to make this possible. The round form preferably has deformable webs that allow the holder to be inserted without  
25 play in a borehole of the connection element. By rotating the holder, the magnetic field sensor suite may then be rotated into the zero position, thereby accomplishing the adjustment.

The holder advantageously has a symmetrical design which  
30 allows a largely stress-free configuration. Since the Hall-effect sensor as IC is mounted directly on the inserts, a decoupling of the Hall-IC from the plastic parts is achieved. This reduces possible mechanical tension that may arise from different temperature coefficients of the various components

across the temperature range. The contacts of the Hall-effect sensor or, alternatively, the inserts, are formed such that a difference in height between the inserts and the Hall contacts is bridged.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the present invention are shown in the figures and explained in greater detail below.

10 Figure 1 shows view of an example connection element.

Figure 2 shows holder for the magnetic field sensor suite.

Figure 3 shows view of the holder while being installed.

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Figure 4 shows the holder installed in the connection element.

Figure 5 shows another view of the holder while being installed.

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Figure 6 shows holder having a round form.

Figures 7a and b show the alignment by rotating the holder.

25 Figure 8 shows a flow chart.

#### DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

The use of seat force sensors to characterize an object on the seat with respect to its weight force and weight-force  
30 distribution is growing. Such seat force sensors may preferably be connection elements that are installed in the seat frame in place of bolts or screws and which are configured in such a way that they are able to ascertain the weight force exerted on the seat. The displacement of a magnet

with respect to a magnetic field sensor suite, which is preferably a Hall-effect sensor, is utilized for this purpose. Decisive for the function of this seat force sensor is that the magnetic field sensor suite is in the zero line of the magnet in the unloaded state, that is to say, exhibits no displacement. The connection element is made up of an inner bending element and an outer sleeve, which is welded sealingly and tightly at one end. This assembly is the active element of the connection element. Inside the connection element, the displacement by application of force is recorded by a Hall-effect sensor. Because of the tolerances of the components and the installation, a precise positioning of the magnet with respect to the Hall-effect sensor so that the measuring element of the Hall-effect sensor lies precisely in the zero line of the magnetic field of the magnet, is generally not possible.

The example holder as described according to the present invention is used to align the magnetic field sensor suite in the production.

The holder is configured and placed in such a way that a simple alignment of the sensor, i.e., the connection element, in the zero position of the magnetic field is possible in the production.

The active element or the spring of the seat force sensor is made up of a bending element 1, which is embodied as double bending bar, of a sleeve 2 welded thereto. This can be seen in Figure 1. Figure 1 shows a view of the connection element. Affixed on bending element 1 is a magnet 4. Sleeve 2 has at its circumference a milled-out region 9, i.e., a groove and an elongated hole 12, so that holder 5 with magnetic field sensor 7, that is to say, the Hall-IC, is able to be introduced into

sleeve 2, and Hall-IC 7 is installed in front of magnets 4. Holder 5 is made up of a plastic part into which a sheet 13 and inserts 6 are injected. Inserts 6 convey the signals of the magnetic field sensor suite to the outside, to three  
5 contact surfaces. Sheet 13 is used both as limit stop for restricting the depth, and as limit stop with respect to the sleeve or groove 10. (Figure 3 and Figure 2). In addition, sheet 13 has an integrated spring element 8, so that sheet 13 is wedged in the groove, but is still able to be displaced  
10 using light force. Because of the spring, holder 5 is placed at edge 10 without play, thereby keeping the clearance between magnetic field sensor suite 7 and magnet 4 constant during the adjustment as well. After the adjustment, sheet 13 is permanently connected to sleeve 2 by laser or resistance  
15 welding.

First, the connection element is inserted into the elongated hole of the sleeve, so that the sheet lies on the flattened region (groove) of the sleeve in a flush manner. The rounded  
20 regions on the spring elements facilitate the insertion of the sheet into the groove, so that the springs press the sheet against the opposite side (without play).

Then, a fitting holding device into which three flexible  
25 contact pins have been introduced is placed on top from "above". These contact pins make contact on the three contact surfaces and press the connection element onto the flattened region by their spring force. At the same time, the device grips the sheet or the plastic of the connection element on  
30 the two free sides.

Using the device, the connection element is then pushed to the limit stop, or away from it, to one side, so that the Hall IC is safely outside the zero line.

Then, while monitoring the signal at the same time, the connection element is pushed in the direction of the center until the output signal corresponds to the center (is zero).

5 In this position the sheet is then welded to the sleeve by laser welding, whereupon the device is removed.

A similar operation is carried out for the variant with rotational adjustment, but a rotary movement is used instead  
10 of a sliding movement.

Figure 4 shows mounted holder 5 in elongated hole 12 in a side view. The connection element may now be installed and electrically connected. Figure 5 shows an alternative holder  
15 during installation in the connection element. The holder has a rounded region 14 via which it is inserted in a borehole 17. Rounded region 14 is situated below a sheet 15 as shown in Figure 6. At the periphery of rounded region 14 are at least three webs 16, which are deformable and allow the holder to be  
20 inserted into borehole 17 without play. Borehole 17 is introduced in sleeve 2.

Figures 7a and b show the adjustment by rotation of the holder. Reference numeral 19 in Figure 7a denotes the  
25 clearance between the holder and the holder's center of symmetry. The zero position is denoted by reference numeral 18. A clear difference between space 19 and zero line 18, which must be remedied by the adjustment, can be seen in Figure 7a. Space 19 of the holder away from the center of  
30 symmetry of the holder is dimensioned such that during the adjustment the magnetic field sensor suite is rotated into zero position 18 of the magnetic field by turning the holder. This has happened in Figure 7b. The magnetic field sensor suite is now adjusted.

Figure 8 elucidates the method according to the present invention in a flow chart. In method step 100, the holder is installed in the sleeve. In method step 101, the adjustment  
5 takes place by the movement of the holder in the sleeve. A linear displacement or a rotation of the holder may be implemented in the process. A combination of these two types of movement is possible as well. If the adjustment was detected, the holder will be fixated in the sleeve in method  
10 step 102, so that the fixation of the adjustment is permanent. This fixation is preferably achieved by laser or resistance welding. In the linear displacement, sheet 13, for instance, may be used for the welding.